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PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Agenda Item 11
Agenda ID 12693

ENERGY DIVISION **RESOLUTION E-4629(rev.)**
February 5, 2014

R E S O L U T I O N

Resolution E-4629. This Resolution names the winning grant recipients of the California Solar Initiative (CSI) Research, Development, Deployment and Demonstration (RD&D) Program's Solicitation #4, with a primary focus on grid integration of solar energy. Pursuant to Decision (D.) 07-09-042, this Resolution requires Commission approval.

PROPOSED OUTCOME: The CSI RD&D Program Manager shall enter into grant agreements with six selected recipients for a total of up to $5.58 million. These will be paid from the CSI RD&D Program Budget.

SAFETY CONSIDERATIONS: There are no adverse public safety impacts associated with this Resolution. New research approved by this Resolution may contribute positively to better knowledge of safety issues concerning the interconnection of generation and storage resources to distribution circuits.

ESTIMATED COST: No additional cost is associated with this Resolution, as funds were authorized by a previous decision.

SUMMARY

This Resolution, made pursuant to D.07-09-042, formally names the winning grant recipients of the CSI RD&D Program's Solicitation #4, with a primary focus on grid integration of solar energy. Resolution E-4629 authorizes the CSI RD&D Program Manager, Itron, Inc., under contract to Pacific Gas and Electric (PG&E), to enter into grant agreements which will provide CSI RD&D grant funding to the winning recipients up to the stated award amounts, and to monitor and report on these recipients' activities pursuant to D.07-09-042.

BACKGROUND

Senate Bill (SB) 1 (Murray, 2006) authorized the Commission to allocate up to $50 million of the CSI program funds for research, development, demonstration, and deployment of solar technologies. The RD&D portion of the CSI program was adopted in September 2007 via D.07-09-042. In that decision, the Commission approved the "Adopted CSI RD&D Plan" which identifies the goals and objectives of the CSI RD&D program, sets forth allocation guidelines, and establishes criteria for solicitation, selection and funding of RD&D projects. It also establishes the guidelines for the RD&D program administration and RD&D program evaluation.

To implement the Adopted CSI RD&D Plan, the Energy Division oversaw the competitive selection of Itron, Inc. as the CSI RD&D Program Manager ("Program Manager"), approved via Resolution E-4179 in July of 2008. The CSI RD&D Program ("Program") is overseen by Energy Division staff, in accordance with D.07-09-042. Operational administration of the CSI RD&D Program is carried out by Itron, Inc. Energy Division staff is responsible for monitoring the Program Manager's expenses and assuring that they act in compliance with D.07-09-042, as well as participating as members of the Scoring and Selection Committees. The Commission authorizes funding awards via Resolution, as recommended by staff and the Program Manager. The Program Manager is responsible for maintaining program data, developing grant solicitations, evaluating grant requests, entering into grant agreements (after approval by Commission Resolution), monitoring progress on all approved projects, and reporting on approved projects. The Program Manager maintains a program Web site: www.CalSolarResearch.ca.gov, which provides details on all of the funded RD&D projects.

The Program is authorized by statute through 2016 and funded by the electric ratepayers of California's three largest investor-owned utilities, namely PG&E, Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E).

The Adopted CSI RD&D Plan lays out the seven key principles of the Program. These principles include:

1. Improve the economics of solar technologies by reducing technology costs and increasing system performance;
2. Focus on issues that directly benefit California, and that may not be funded by others;

3. Fill knowledge gaps to enable successful, wide-scale deployment of solar distributed generation technologies;
4. Overcome significant barriers to technology adoption;
5. Take advantage of California's wealth of data from past, current, and future installations to fulfill the above;
6. Provide bridge funding to help promising solar technologies transition from a pre-commercial state to full commercial viability; and
7. Support efforts to address the integration of distributed solar power into the grid in order to maximize its value to California ratepayers.

The Adopted CSI RD&D Plan (D.07-09-042) establishes the recommended allocation of funding across different types of RD&D. Demonstration projects should receive the largest portion of the RD&D budget, followed by research, development and deployment. The majority of funds will also be awarded to relatively low-risk projects with project results expected within 1-3 years time. The Adopted CSI RD&D Plan also establishes guidelines for match funding. Applicants with projects close to commercialization are expected to bring a higher level of match funding.

Within the Program, grant funding is further allocated into three target areas:

- Grid integration
- Production technologies
- Business development and deployment

In March of 2010, the Commission adopted Resolution E-4317 for Solicitation #1, which awarded $9,320,472 in funding to 8 projects focused on grid integration.

In September of 2010, the Commission adopted Resolution E-4354 for Solicitation #2, which awarded $14,630,058 in funding to 9 projects focused on improved photovoltaic (PV) production technologies and innovative business practices.

In March of 2012, the Commission adopted Resolution E-4470 for Solicitation #3, which awarded $7,624,154 in funding to 7 projects focused on grid integration of solar energy with a secondary focus on improved photovoltaic (PV) production technologies and business development and deployment.

NOTICE

This Resolution is presented on motion of the Energy Division and not in response to an Advice Letter.

PROTESTS

This Resolution is not the result of an Advice Letter; therefore there were no protests or responses.

DISCUSSION

Focus of the Fourth Grant Solicitation

The Adopted CSI RD&D Plan suggests that 50-65 percent of CSI RD&D Program funds be allocated to grid integration projects, with 10-25 percent allocated to production technologies and 10-20 percent allocated to business development and deployment projects.

CSI RD&D Funding by Focus Area, Solicitations 1-3

	Funds Granted	Funding Targets
Grid Integration	$15,645,013	$25,000,000 - $32,500,000
Production Technologies	$5,083,369	$5,000,000 - $12,500,000
Business Models	$7,399,071	$5,000,000 - $10,000,000
Solar Energy Research Center	$10,000,000	NA
Total	$38,127,453	$35,000,000 - $55,000,000

The fourth CSI RD&D Program solicitation was released on June 13, 2013 and had a primary focus on grid integration[1].

The primary objectives for this solicitation include:

- Overcoming existing barriers to integrating high penetration PV into the electricity grid, and
- Accelerating the integration and interconnection of high penetration PV into the grid.

[1]The CSI RD&D Program fourth solicitation document is available here: http://calsolarresearch.org/images/stories/documents/Sol4_proposal_docs/CSIRDD_Sol4_FINAL_20130612.pdf

The CSI RD&D Program Manager used various information resources to identify critical areas to target with the fourth solicitation and refine the priority areas identified above. These information resources include:

- The joint California Energy Commission and California Public Utilities Commission Solar Photovoltaic Research Plan (Roadmap)[2], which highlighted issues important to California, provided RD&D approaches, and set milestones.
- Direct contact with over two dozen entities involved in solar RD&D efforts[3] to ensure that the RD&D program's efforts are not duplicative.
- Stakeholder input received at the CPUC DOE High Penetration Solar Forum.[4]

Timeline of the Grant Solicitation

The following outlines the timeline and process for the fourth grant solicitation.

- On May 16, 2013, the fourth solicitation and CSI RD&D grant agreement were issued in Draft form for public comment by the Program Manager to the R.10-05-004 service list, as well as to a mailing list maintained by the Program Manager.
- On May 31, 2013, comments on the fourth solicitation were received from stakeholders. Comments were considered prior to the release of the final solicitation documents.

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[2] Solar Photovoltaic Research Plan, California Energy Commission, CEC-500-2007-038-SD, September 2007. http://listserver.energy.ca.gov/2007publications/CEC-500-2007-038/CEC-500-2007-038-SD.PDF

[3] Contact with other organizations involved in solar RD&D included: California Energy Commission, U.S. Department of Energy (Solar American Initiative and Solar American Board of Codes and Standards), U.S. Department of Energy national laboratories (NREL, Sandia), NYSERDA, New Jersey's Edison Innovation Commercialization Fund and Clean Energy Manufacturing Fund, Massachusetts Technology Collaborative Congestion Relief Pilots, Oregon Department of Energy, Hawaii Clean Energy Initiative, Sacramento Municipal Utility District's ReGen Program, Los Angeles Department of Water and Power's Sunshares program, a variety of California universities (including California Institute of Technology, Stanford University, UC San Diego, UC Davis, UC Merced, and UC Santa Cruz), a variety of universities in other states (including Arizona State University, Colorado State University), and leading solar industry companies.

[4] http://calsolarresearch.org/Funded-Projects/solarforum.html

- On June 13, 2013, the revised fourth solicitation was issued, including the grant agreement document. The solicitation was issued to the R.10-05-004 service list, as well as to a mailing list maintained by the Program Manager.
- On June 27, 2013, a bidder's conference webinar was held by the Program Manager to review the intent and goals of the program, and to allow prospective bidders to ask questions.
- By June 28, 2013, written questions were submitted to the Program Manager regarding the solicitation.
- On July 9, 2013, responses to submitted questions were posted on the CSI Program website by the Program Manager.
- On August 7, 2013, proposal responses were due to the Program Manager. A total of 17 proposals were received. Of these, 3 did not pass the initial screening and were eliminated. The remaining 14 proposals, which requested $14,610,714 in funds and contributed $17,426,552 in match funds, passed the initial screening.
- In August and September 2013, the 14 proposals that passed the initial screening underwent technical review. This technical review assessed the practical feasibility, path to implementation, and funding level requested of the various proposals.
- The Scoring Committee comprised of Itron personnel, industry experts and representatives of the CPUC, evaluated the 14 proposals using the Proposal Evaluation criteria described in Table 1.
- In October 2013, the Scoring Committee made recommendations to the CPUC. In November 2013, the CPUC's Energy Division made the final determination of the recommended proposals identified in Table 2 (See page 9).

Proposal Evaluation Criteria for Grant Solicitation

All 14 proposals were scored using the proposal evaluation criteria identified in Table 1. Proposals needed to obtain 75 percent (or 150 points) of the possible 200 points to be considered for funding. Of the 14 proposals that were evaluated by the Scoring Committee, six passed the minimum 75 percent passing score and are recommended for funding.

Table 1: Proposal Evaluation and Scoring Criteria

SCORING CRITERIA	MAX. POINTS POSSIBLE
1. How well does the proposed research address the seven key principles in the CSI RD&D Plan? (See pg. 1-2 of this solicitation). (Section 2)	30
2. Performance & cost objectives well defined & appropriate? (Sec 3)	10
3. Is the approach outlined in Section 4 appropriate to meeting the project goals and objectives? Is there enough detail to understand the specifics of what work will be done?	20
4. Are the proposed deliverables of value to the California market? Will they support the goals of the CSI program? (Section 5)	20
5. Is the proposed team for the project highly qualified to conduct the work being proposed? Do they have prior experience conducting similar work? (Section 6)	20
6. Does the proposed project include utility participation? Are participation and match funding from the utility partner substantiated and appropriate for the proposed project? (Section 7)	10
7. Are the amounts and uses of the funding requested appropriate for the work to be performed? Is the funding request reasonable? Is the funding request in-line with the potential benefits that can be realized? (Section 8)	10
8. How well does the proposed project leverage funds from other organizations? How well has the proposal demonstrated the match-funding component of the proposed project? Does the proposed project provide added value by collaborating and coordinating with other RD&D organizations? (Section 9)	20
9. Does the proposed project address an important barrier to achieving the goals of the CSI RD&D Program? Is the proposed project sound from a technical, economic, policy, and market perspective? (Section 10)	30
10. How close is the proposed project to commercialization? Are the project results expected in the 1-3 year horizon? Is the proposed path to market for the results of this research practical and achievable? (Section 11)	20
11. Does the proposed project have an educational, technical transfer, or informational component? Are the research products valuable? Is there a plan for effective dissemination of information gained	10

SCORING CRITERIA	MAX. POINTS POSSIBLE
from the project? (Section 12)	
Total Points Possible	**200**
Points Needed to Pass (75% of total)	**150**

Proposals Recommended for Funding from Grant Solicitation #4

The proposals recommended for funding are identified in Table 2. Each proposal recommended for funding is described in greater detail in Appendix A of this Resolution. As shown in Table 2, the proposals recommended for funding total $5,577,195 in grant funding with $6,635,217 in match funding

As described in Appendix A, on a project by project basis, the Scoring Committee recommended reducing certain project funding levels from the amounts originally requested in order to maximize project benefits, not fund work being done by others and to meet or exceed the cost share guidance provided in the grant solicitation. The guidance was consistent with the cost share guidance adopted in D.07-09-042. The level of cost-sharing achieved in the selected grants is sufficient both on an overall and per project basis.

Table 2: Recommended proposals and funding summary

412	Standard Communication Interface and Certification Test Program	Electric Power Research Institute	$885,675	$885,675	$1,016,693
405	PV Integrated Storage - Demonstrating Mutually Beneficial Utility-Customer Business Partnerships	Energy and Environmental Economics	$815,500	$815,500	$1,072,980
421	Demonstration of Locally Balanced ZNE Communities Using DR and Storage and Evaluation of Distribution Impacts	Electric Power Research Institute	$1,485,476	$1,485,476	$2,155,000
408	Analysis to Inform California Grid Integration Rules for PV	Electric Power Research Institute	$399,494	$399,494	$399,494
403	Advanced Distribution Analytic Services Enabling High Penetration Solar PV	Southern California Edison	$934,000	$934,000	$934,000
418	Comprehensive Grid Integration of Solar Power for SDG&E	University of California, San Diego	$1,500,000	$1,057,050	$1,057,050
	Total		**$6,020,145**	**$5,577,195**	**$6,635,217**

The six proposals recommended for funding cut across various topic areas as shown in Table 3 below.

Table 3: Comparison of Proposals by Focus Area

Project ID	Project Title	Applicant Organization	Interconnection / Rule 21	Advanced Inverter/Hardware	Storage	Utility Program/Policy	Forecasting	Analysis	Tool/Test Protocol Development	Demonstration
412	Standard Communication Interface and Certification Test Program	Electric Power Research Institute	X	X				X	X	
405	PV Integrated Storage - Demonstrating Mutually Beneficial Utility-Customer Business Partnerships	Energy and Environmental Economics			X	X				X
421	Demonstration of Locally Balanced ZNE Communities Using DR and Storage and Evaluation of Distribution Impacts	Electric Power Research Institute			X					X
408	Analysis to Inform California Grid Integration Rules for PV	Electric Power Research Institute	X					X		
403	Advanced Distribution Analytic Services Enabling High Penetration Solar PV	Southern California Edison	X						X	
418	Comprehensive grid integration of solar power for SDG&E	University of California, San Diego			X		X		X	

Proposal Summaries for Projects Recommended for Funding

The following discussion provides a short summary of each project recommended for funding. A brief comparison of the proposals recommended for funding is also provided.

1. Proposal 412: Electric Power Research Institute

Proposal 412 from the Electric Power Research Institute (EPRI) seeks to accelerate the availability of inverters with advanced control features that are compatible with utility communication systems. The project will also develop a standard

testing and certification program for advanced inverters. This will include an open source software test tool and test procedures that meet both California Rule 21[5] and IEEE 1547[6] standards. The advanced inverters will be installed and field tested on two different utility communication systems within the SCE and Sacramento Municipal Utility District (SMUD) service territories to gain insights into the operation of real-world utility communication systems. The EPRI research project will provide significant support to the California Rule 21 and IEEE 1547 processes.

Inverter manufacturers (Fronius and SMA) and the SunSpec Alliance (trade organization) are partners on this project, ensuring that the research products will be credible and valuable from an industry perspective.

2. Proposal 405: Energy and Environmental Economics

Proposal 405 from Energy and Environmental Economics (E3) will conduct a demonstration to assess the performance and benefits of integrating PV with energy storage and demand response. Control strategies will be integrated into a 34 unit Zero Net Energy (ZNE) development to both reduce customer bills and provide distribution system benefits for PV integration. The strategies to be assessed include demand response, time-of-use pricing and peak load reduction, firming PV generation, scheduling and dispatch of spinning reserves and voltage support.

SMUD has demonstrated a strong commitment to this research and has contributed significant match funding. SMUD has also agreed to implement the research findings and recommendations pertaining to tariffs, incentives and programs.

[5] Electric Rule 21 is a tariff that describes the interconnection, operating and metering requirements for generation facilities to be connected to a utility's distribution system, over which the California Public Utilities Commission (CPUC) has jurisdiction.

[6] IEEE 1547 is a standard of the Institute of Electrical and Electronics Engineers that sets criteria and requirements for the interconnection & interconnection test requirements for interconnecting distributed generation resources with the power grid in the United States.

3. Proposal 421: Electric Power Research Institute

Proposal 421 from the EPRI will demonstrate and evaluate the grid impacts of a "near-ZNE" community on the local distribution system. The research team will develop ZNE packages including photovoltaics (PV), home energy management systems (HEMS), energy storage and demand response (DR) for inclusion in a 60 home community in California. The project will demonstrate how HEMS, DR and storage can be used to mitigate possible grid issues. The EPRI team will integrate building energy models and distribution models to predict building requirements for desired load shapes.

The project includes an extensive list of deliverables that will be valuable to various stakeholder groups including home builders, utilities and standards and policy setting entities (CEC, CPUC, and the California Independent System Operator [CAISO]).

4. Proposal 408: Electric Power Research Institute

Proposal 408 from EPRI will conduct analysis to help inform California's rules that guide integration of PV into the electricity grid. The team will work with utilities, the CAISO and the Smart Inverter Working Group[7] to develop guidelines for effective use of smart inverters given the "hosting capacity"[8] of the California grid. This work will build on EPRI's feeder characteristics work funded by CSI RD&D Solicitation #3. The EPRI team will determine the functionality requirements for inverters including set points, inverter ratings and response times, to inform the CA Rule 21 proceeding.

The results of this project will assist the utilities in dealing with high penetration PV and will be directly relevant to the CPUC Interconnection Proceeding (R.11-09-011[9]). Outreach for this project will include webinars, workshops and a Final Project Report.

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[7] The Smart Inverter Working Group (SIWG) was formed by the California Public Utilities Commission and California Energy Commission to develop recommendations for changes to Rule 21, which regulates grid-interconnected distributed generation resources.

[8] Hosting capacity is the maximum amount of distributed generation that can be interconnected on a power grid without affecting grid performance.

[9] http://www.cpuc.ca.gov/PUC/energy/Procurement/LTPP/rule21.htm

5. Proposal 403: Southern California Edison

The goal of Proposal 403 from SCE is to streamline the interconnection process allowing for higher penetration levels of PV on the distribution system. Leveraging previous and ongoing CSI RD&D funded research, the SCE team will identify the limiting factors and mitigation measures for achieving 50%, 75% and 100% PV penetration levels on SCE feeders. Mitigation may include 1) infrastructure improvements, 2) implementation of advanced controls, 3) energy storage and/or 4) demand response. The research will result in a set of representative distribution feeders for the SCE territory along with an understanding of how much PV each feeder can support using the measures for mitigation. The audience for this project is primarily SCE; however the tools and methods will also be available and useful to the other utilities dealing with high PV penetration issues.

6. Proposal 418: University of California, San Diego

Proposal 418 from the University of California, San Diego (UCSD) seeks to advance solar and load forecast modeling in the SDG&E territory by improving previously developed forecasting tools. In partnership with SDG&E, the UCSD team will use solar and net load forecasting with planning and simulations to determine the best locations for energy storage based on system performance and expected solar performance. The team will also develop a control algorithm to interface with existing utility software and solar forecasting to maximize energy storage, PV performance and PV integration. The primary audience for this research is SDG&E; however there is value to the other utilities in using net load and solar forecasting to address grid integration issues.

Overall Comparison of Primary Focus Area (Grid Integration)

All six proposals recommended for funding focus on grid integration.

Three recommended projects address utility interconnection of PV and research that supports assessing and streamlining the interconnection process. Two of these are inverter research projects proposed by EPRI. The focus of the first EPRI Project (Proposal 412) is to accelerate the availability of advanced inverters that work within the utility communication network. The project will develop and make available a standard testing and certification program for advanced inverters. The second recommended EPRI project (Proposal 408) will build on the CSI RD&D #3 funded research on distribution feeders to determine the functional requirements, set points, ratings and response times for smart inverters. The third

project related to interconnection is SCE's proposal to identify and analyze limiting factors and mitigation measures for achieving 50%, 75% and 100% PV penetration levels on SCE feeders. The primary audience for this research is SCE; however the research process and methods can be extended to other California utility service territories. All three projects will help inform CPUC decision-making regarding interconnection and operating requirements for high penetration PV.

Three of the projects recommended for funding have an energy storage component. The Energy and Environmental Economics (E3) project will use a 34 unit Zero Net Energy (ZNE) development to demonstrate the benefits of PV integrated with energy storage and demand response to both the utility and the customer. This research will result in program recommendations for both utilities and policy makers. The second energy storage related project, led by EPRI (Proposal 421) will demonstrate and evaluate the impacts of a near-ZNE community on the local distribution system and develop mitigation strategies using both building management systems and energy storage. Meritage, the builder-partner on the team, has committed to building a 60 home near-ZNE community that will be used for this demonstration.

The UCSD project will build on their current CPUC-funded solar forecasting research as well as research supported by the Department of Energy, to integrate solar forecasting and net load forecasting to identify feeder issue hot spots and prioritize feeder upgrades and energy storage sites. An integrated tool will be developed that combines solar forecasting with utility planning and simulation software to determine the best location for energy storage based on system performance and expected solar performance.

CSI RD&D Program Manager Responsibilities

The Program Manager shall finalize Grant Agreements with each of the recommended proposers, based upon the submitted scope of work. Awards from this grant solicitation shall be contingent on the grantees finalizing this Grant Agreement and entering into a contract with the Program Manager within 120 days of the Commission decision.

The Program Manager shall review the budgets of each proposal prior to finalizing a Grant Agreement with each recipient. During the months since the proposals were submitted, the funding levels may have shifted if, for example, a

proposer has since received funding from another source for the same work. Therefore, the Program Manager will ensure that the funding levels are still accurate in light of any potential changes to project partners, project scope, or matching funds. If projects have received funding from another source (or lost matching funds) since the submittal of the proposal, the budget shall be modified to reflect this new information, while remaining within the boundaries of matching fund requirements.

Finally, nearly all of the RD&D projects funded by the Program in the fourth solicitation will benefit from collaboration among reward recipients, as well as collaboration with all of the investor owned utilities. Several of the selected projects are relevant to ongoing CPUC activities, such as the interconnection proceeding, R.11-09-011. Additionally, California utility representatives and industry stakeholders have offered to participate in informal collaboration committees to aid the award recipients in the success of the RD&D projects selected under this solicitation. As discussed above, several selected proposals will work in similar areas using different methods, and it is logical that the different recommended winners should have an opportunity to share their approaches and work products. The Program Manager will work to create a collaboration committee process to aid in the success of the CSI RD&D Program grant recipients. This process will ensure that input is provided to the grant recipients early in their projects, as the projects progress, and through a forum to share results and products when the project is complete. The Program Manager shall ensure this activity is included in all grant agreements via the scope of work.

The Program Manager shall reach a final grant agreement with each of the award recipients approved for funding within 120 days of the effective date of this Resolution. The Commission's Energy Division may extend this deadline or cancel an award if an agreement is not signed within 120 days of the Commission decision. The grant agreement will codify the scope identified in the proposal, enhanced or modified by the Scoring Committee and the Program Manager under the oversight of the Commission's Energy Division. The grant agreement will specify a CSI RD&D Program funding amount that is consistent with this Resolution and modified in a mutually agreeable manner as specified above and in the best judgment of the Program Manager under the oversight of the Commission's Energy Division.

COMMENTS

Public Utilities Code section 311(g)(1) provides that this Resolution must be served on all parties and subject to at least 30 days public review and comment prior to a vote of the Commission. Section 311(g)(2) provides that this 30-day period may be reduced or waived upon the stipulation of all parties in the proceeding.

Accordingly, this draft resolution was emailed to parties for comments.

No comments were received.

FINDINGS

1. The CSI RD&D fourth grant solicitation with a primary focus on grid integration was carried out in accordance with the Commission direction establish in D.07-09-042.
2. The CSI RD&D Program Manager, Itron, Inc., under Energy Division oversight, reviewed the grant proposals in a manner consistent with the plan set forth in D.07-09-042.
3. The CSI RD&D Program Manger undertook a two part process, including a Technical Review and Scoring Process, consistent with the direction set forth in D.07-09-042.
4. The scoring process resulted in six proposals that meet the 75 percent scoring threshold and are recommended for funding. These six grant recipients, described in detail in Appendix A to this Resolution and specified as follows, have submitted proposals which meet the goals of the RD&D Program as described in D. 07-09-042.
    a. Proposal 412 – Electric Power Research Institute – up to $885,675
    b. Proposal 405 – Energy and Environmental Economics – up to $815,500
    c. Proposal 421 – Electric Power Research Institute – up to $1,485,476
    d. Proposal 408 – Electric Power Research Institute – up to $399,494
    e. Proposal 403 – Southern California Edison – up to $934,000
    f. Proposal 418 – University of California, San Diego – up to $1,057,050

THEREFORE IT IS ORDERED THAT:

1. The CSI RD&D Program Manager shall execute Grant Agreements with the following recommended 6 proposers, contingent upon their meeting all requirements detailed in the ordering paragraphs below:
    a. Proposal 412 – Electric Power Research Institute – up to $885,675
    b. Proposal 405 – Energy and Environmental Economics – up to $815,500
    c. Proposal 421 – Electric Power Research Institute – up to $1,485,476
    d. Proposal 408 – Electric Power Research Institute – up to $399,494
    e. Proposal 403 – Southern California Edison – up to $934,000
    f. Proposal 418 – University of California, San Diego – up to $1,057,050
2. The CSI RD&D Program Manager shall monitor and report on the progress of grant awards to the Commission pursuant to D.07-09-042.
3. The Energy Division shall review all Grant Agreements prior to their execution.
4. The Grant Agreements will not be subject to negotiation.
5. Awards from the CSI RD&D fourth grant solicitation shall be contingent on the grantees entering into an agreement with the CSI RD&D Program Manager within 120 days of the effective date of this Resolution. The Commission's Energy Division may extend this deadline or cancel an award if an agreement is not signed within 120 days of the Commission decision.
6. The CSI RD&D Program Manager shall finalize Grant Agreements with each proposal's Principal Investigator based upon the submitted scope of work and budget. The Grant Agreement will be for the scope identified in the proposal, enhanced or modified by the Scoring Committee and the CSI RD&D Program Manager under the oversight of the Commission's Energy Division. For some recommended awards, the scope of the project and the recommended funding levels may be reduced from what was requested in the proposal.
7. The CSI RD&D Program Manager must ensure that the funding level for each project is accurate, and determine whether revisions are needed due to potential changes to project partners, project scope, or matching funds.
8. The CSI RD&D Program Manager shall work to create a collaboration committee process to aid in the success of the CSI RD&D grant projects. This process will ensure that the grant projects are coordinated with the relevant CPUC staff, provide input to the grant recipients early in their projects, provide an opportunity for peer review of projects while in process, and create

a forum to share results towards the end of projects when results have been achieved.

9. This Resolution is effective today.

I certify that the foregoing Resolution was duly introduced, passed and adopted at a conference of the Public Utilities Commission of the State of California held on February 5, 2014; the following Commissioners voting favorably thereon:

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Paul Clanon
Executive Director

Appendix A

Project ID	412
Project Title	Standard Communication Interface and Certification Test Program
Applicant	Electric Power Research Institute (EPRI)
Principal Investigator	Brian Seal
Partners	SunSpec Alliance, SMA, Fronius, Sandia, TUV Rheinland and Xanthus Consulting
Utility partner	Southern California Edison (SCE), Sacramento Municipal Utility District (SMUD)
Requested Funding	$ 885,675
Recommended Funding	$ 885,675
Proposed Match Funding	$ 1,016,693
Recommended Match Funding	$ 1,016,693
Target Area	Grid Integration
Project Summary	The goals of this project include: • Accelerating the availability of inverter products that incorporate advanced control features and are compatible with utility communication systems, • Providing a ready standard test and certification framework, and • Addressing the critical gaps and providing support for California Rule 21 and IEEE 1547 activities. The EPRI team will develop and demonstrate standardized inverter communication interface that is compatible with utility communication networks. The project will also develop and make available a standard testing and certification program for advanced inverters including an open source software test tool and test procedures that meet CA Rule 21 and IEEE 1547. SCE and SMUD will identify utility requirements and field test certified inverter systems on their utility networks.
Deliverables	Project deliverables include: Functional and Interface Requirements Document – Inverter Compliance and Security Test Procedures, Open Source Software Tool and Conformance Testing Results – Communications Modules Compatible with Utility Systems – Four working inverter prototypes for interoperability testing from 2 inverter manufacturers – Two utility communication systems to support advanced inverter functions – Laboratory Interoperability Testing Report – Final Report
Market Connection/ Audience	Support and match funding from the SunSpec Alliance (trade organization representing 80% of the inverter market), Fronius (inverter manufacturer), Xanthus Consulting International (automation, communication and cyber security for utilities), SCE and SMUD demonstrate a strong commitment and market connection for the project. SMA, the leading inverter manufacturer and Fronius (ranked #5) are participating in the project and have committed to testing and certification for their products. It is anticipated that several additional inverter companies will follow suit. This project also will also provide significant support for California's interconnection requirements (Rule 21).

Recommendation	Recommend for funding up to $885,675. The Scoring Committee requests that the project performance and cost objectives be further refined and that the project schedule fall in-line with the CA Rule 21 Proceeding.
Project ID	405
Project Title	PV Integrated Storage- Demonstrating Mutually Beneficial Utility-Customer Business Partnerships
Applicant	Energy and Environmental Economics (E3)
Principal Investigator	Eric Cutter
Partners	Energy Solutions, Sacramento Municipal Utility District (SMUD), Sunverge, Sungevity, Rocky Mountain Institute, UC Berkeley and California Institute for Energy and Environment (CIEE)
Utility partner	Sacramento Municipal Utility District (SMUD), Pacific Gas &Electric (letter of support)
Requested Funding	$ 815,500
Recommended Funding	$ 815,500
Proposed Match Funding	$ 1,072,980
Recommended Match Funding	$ 1,072,980
Target Area	Grid Integration
Project Summary	The E3 team will demonstrate the performance and benefits of PV integrated energy storage and demand response. Using a 34 unit zero net energy (ZNE) development in Sacramento, the E3 team will implement control strategies to both reduce customer bills and provide distribution system benefits for PV integration. These strategies including time-of-use pricing and peak load reduction, firming PV generation, demand response, shaping net loads, scheduling and dispatch of spinning reserves and voltage support. The project will demonstrate the benefits of PV integrated with storage and demand response to both the customer and the utility and will result in program recommendations for utilities and policy makers.
Deliverables	Project deliverables include: Report on Utility Demand Response Interface – Report on the Demonstration of Utility Managed PV Integration at Existing Sites – Report on the Installation of PV and Sunverge SIS Systems at New Customer Sites – Report on the Avoided Cost Framework for Quantification of Local Distribution System Benefits – Report on Incentive Programs for Customer-Owned Storage and Loads for PV Integration – Final Project Report
Market Connection/ Audience	SMUD demonstrates a strong commitment to this project with significant match funding and agreement to implement the research findings on tariffs, incentives and program recommendations. Determining the benefits of PV integrated with storage and demand response from both the customer and the utility will also be value to other utilities and policy makers.
Recommendation	Recommend for funding up to $815,500. The Scoring Committee requests that the project include investor-owned utilities to ensure that the research scope, results and findings are also of value to them. The project deliverables should be better defined to ensure that they are useful to entities beyond SMUD.

Project ID	421
Project Title	Demonstration of Locally Balanced ZNE Communities Using DR and Storage and Evaluation of Distribution Impacts
Applicant	Electric Power Research Institute (EPRI)
Principal Investigator	Ram Narayanamurthy
Partners	BIRAenergy, Meritage Homes, Energy + Environmental Economics, Quantum, Southern California Edison, Pacific Gas &Electric
Utility partner	SCE, PG&E
Requested Funding	$ 1,485,476
Recommended Funding	$ 1,485,476
Proposed Match Funding	$ 2,155,000
Recommended Match Funding	$ 2,155,000
Target Area	Grid Integration
Project Summary	The EPRI team will demonstrate and evaluate the impacts of a near-Zero Net Energy (ZNE) community on the local distribution system and develop mitigation strategies using building energy management systems and energy storage. The team will develop ZNE packages including photolvatics (PV), home energy management systems (HEMS), storage and demand response (DR) for inclusion in a Meritage 60 home community in California. Modeling approaches will be used to predict the impacts on distribution systems and mitigation strategies will be developed. The project will demonstrate how HEMS, DR and storage can mitigate possible grid issues. The project will also integrate building energy models and distribution models to predict building requirements for desired load shapes. The project objectives include demonstrating and evaluating: • Cost effective energy efficiency (EE) packages to achieve ZNE • ZNE homes with PV, storage, HEMS and DR can provide grid benefits • HEMS and DR can manage end-use loads to enable greater PV penetration • Various locations for energy storage to address distribution issues • Measured impacts that ZNE communties have on distribution feeders • Identify requirements for ZNE communities to include in IOU ZNE programs and CA Title 24 • Integrate ZNE building modeling approaches with distribution models
Deliverables	This project will produce an extensive list of deliverables, including: Report on EE packages developed, construction of ZNE community and energy use (modeled vs. measured) – Reports on the selection, demonstration and results from HEMS, storage, DR and the value to IOUs – Multiple reports on energy storage to mitigate ZNE grid impacts – Report on distribution system efficiencies and load shapes with ZNE over 3 seasons – Builder Resource Document – Economic analysis of ZNE – Technical documents for utilities, grid operators code officials and the CEC – Final Project Report
Market Connection/ Audience	This project has a very strong market connection component with several audiences that will benefit from this research including home builders, utilities, standards and policy setting entities (CEC, CPUC). In particular Meritage Homes has committed to building a minimum of 60 near-ZNE homes.
Recommendation	Recommend for funding up to $1,485,476. The Scoring Committee believes that this research can significantly advance the understanding of the impacts and mitigation strategies of ZNE communities on the distribution grid.

Project ID	408
Project Title	Analysis to Inform California Grid Integration Rules for PV
Applicant	Electric Power Research Institute (EPRI)
Principal Investigator	Jeff Smith
Partners	Sandia, National Renewable Energy Laboratory
Utility partner	letters of support from Southern California Edison, Sempra, Sacramento Municipal Utility District, PJM
Requested Funding	$ 399,494
Recommended Funding	$ 399,494
Proposed Match Funding	$ 399,494
Recommended Match Funding	$ 399,494
Target Area	Grid Integration
Project Summary	Working with the investor-owned utilities, the California Independent System Operator and the Smart Inverter Working Group, the EPRI team will develop guidelines for effective use of smart inverters given the hosting capacity of the California grid. EPRI will build on their current CSI Solicitation#3 research results in feeder characterization and analysis to propose Rule 21 definitions for grid support functions using open source modeling tools. Specific tasks include: • Selection of 7-10 feeders that are known to have a wide range of hosting capacities for solar PV • Determining the functionality requirements for high penetration PV, including set points, inverter ratings and response times to inform CA Rule 21 rulemaking • Perform bulk-system transient stability analysis to determine the range of voltage and frequency profiles • Coordination and outreach with stakeholders, in particular, the California Energy Commission and the California Public Utilities Commission to inform the CA Rule 21 proceeding.
Deliverables	Project deliverables include: Report on Distribution Requirements for Smart Inverters – Report on bulk system requirements for inverters – Project outreach webinars and workshops – Final Project Report
Market Connection/ Audience	The path to market for this research is direct (Rule 21 Proceeding) and the results will assist the utilities in dealing with high penetration PV. The key stakeholders groups (CAISO, SCE, Sempra, SMUD, Smart Inverter Working Group) are all integrated into this project.
Recommendation	Recommend for funding up to $399,494. The Scoring Committee requests that the project performance and cost objectives be further refined. Additionally, the team should fully leverage the findings from the DOE-funded SEGIS-AC smart inverter demonstration projects.

Project ID	403
Project Title	Advanced Distribution Analytic Services Enabling High Penetration Solar PV
Applicant	Southern California Edison
Principal Investigator	Robert Sherick
Partners	Pacific Northwest National Laboratory, Qado Energy
Utility partner	Southern California Edison (SCE)
Requested Funding	$ 934,000
Recommended Funding	$ 934,000
Proposed Match Funding	$ 934,000
Recommended Match Funding	$ 934,000
Target Area	Grid Integration
Project Summary	The goal of this Southern California Edison project is to streamline the interconnection process allowing for higher penetration levels of distributed PV. The SCE team will identifying the limiting factors and mitigation measures for achieving 50%, 75% and 100% PV penetration levels on SCE feeders, however the process and methods can be extended to other California service territories. Leveraging previous and ongoing CSI RD&D research projects, the SCE team will identify and analyzed prototype feeders in detail to determine operational limits and mitigation strategies including 1) infrastructure improvements, 2) implementing advanced controls, 3) energy storage and/or 4) demand response (DR). This work will result in a set of representative distribution feeders for the SCE service territory and an understanding of how much PV each feeder type can support using measures for mitigation. The work will result in a streamlined process for interconnection.
Deliverables	Project deliverables include: a Cloud-Based Management System and Management Tools – Report on Prototype Distribution Feeders and Upgrade Path for each of the Prototype Feeders – Reports Validating the Methods, Field Measurements and Cloud-Based Tool – Final Project Report
Market Connection/ Audience	The audience for this research is primarily Southern California Edison; however the tools and methods will also be valuable to the other utilities. The research results should be available to the market relatively quickly.
Recommendation	Recommend for funding up to $934,000. The Scoring team notes that the project deliverables need further clarification to ensure that all work using CSI RD&D funds is made available to the public. Additionally the Scoring team requests that the research team enhance their outreach and technology transfer plan and investigate methods for making this work valuable to other utilities and stakeholders. Performance and cost objectives also need to be further defined.

Project ID	418
Project Title	Comprehensive grid integration of solar power for SDG&E
Applicant	University of California, San Diego
Principal Investigator	Jan Kleissl
Partners	Exon, Vertum Partners, letters of support from CAISO, SMUD, PG&E, SCE, Pulama Lanai, CEC
Utility partner	SDG&E
Requested Funding	$ 1,500,000
Recommended Funding	$ 1,057,050
Proposed Match Funding	$ 1,567,482
Recommended Match Funding	$ 1,057,050
Target Area	Grid Integration
Project Summary	The UCSD and SDG&E team proposes to advance solar and load forecast modeling in SDG&E territory by improving and operationalizing previously developed forecasting tools at high temporal and spatial resolution. Using solar and net load forecasting, SDG&E can identify feeder issue hot spots and prioritize feeder upgrades and energy storage sites. The team will develop a tool that integrates solar forecasting with planning and simulation software to determine the best locations for energy storage based on system performance and expected solar performance. Additionally the team will develop a control algorithm to interface with existing utility sofware and solar forecasting to maximize energy storage, PV performance and PV integration. The tasks for this project include: • Advanced Operational Ensemble Solar Forecasting System • Granular Net Load Forecasting and Integration with Customer Energy Management System • Energy Storage Siting and Dispatch Optimization
Deliverables	Project deliverables include: Improved Solar Forecast Model – Report on Model and Ramp Rate Analysis – SDG&E Substation Net Load Forecast and Report – Report Describing Methodology and Results from Feeder Hot Spot Classification – Energy Storage Siting Methods Report – Optimization Tools Optimization and Use Cases Report – Final Project Report
Market Connection/ Audience	The audience for this research is largely SDG&E; however the other utilities may find value in using net load and solar forecasting to address grid integration issues.
Recommendation	Recommend for funding up to $1,057,050. The Scoring Committee sees value in funding Task 4 (Energy Storage Siting and Dispatch Optimization) of the UCSD proposal and notes that Tasks 2 and 3 of the proposal overlap with work funded by the Department of Energy being done by another entity for SDG&E. For this reason, the Scoring Committee recommends a significantly reduced scope for Tasks 2 and 3, solely to enable the team to complete Task 4. Additionally, the Committee recommends removal of Task 4.5 and the associated match from the scope of the project and that UCSD make up any remaining match funding to ensure that the 50% match is achieved.

End of Appendix